WHAT IS CLAIMED IS:

1. An optical device comprising:

(a) a waveguide layer that includes a waveguide comprised of a second-order nonlinear optical polymer and at least a first and second grating;

(b) a means for communicating a negative electric field to said first grating; and

(c) a means for communicating a positive electric field to said second grating.

2. An optical device comprising:

(a) a waveguide layer that includes a waveguide comprised of a second-order nonlinear optical polymer and at least a first and second grating;

(b) a first electrode positioned so as to communicate a negative electric field to said first grating upon application of a negative voltage to said first electrode; and

(c) a second electrode positioned so as to communicate a positive electric field to said second grating upon application of a positive voltage to said second electrode.

3. The optical device according to claim 2, wherein said device further comprises one or more cladding layers.

4. The optical device according to claim 2, wherein said device further comprises a substrate layer.

5. The optical device according to claim 2, wherein said device is an optical modulator.

6. The optical device according to claim 2, wherein said device is an optical attenuator.

7. The optical device according to claim 2, wherein one of said gratings is tunable.

8. The optical device according to claim 2, wherein both of said gratings are tunable.

9. The optical device according to claim 2, wherein one of said gratings is comprised of an optical nonlinear second-order polymer.

10. The optical device according to claim 2, wherein both of said gratings are comprised of an optical nonlinear second-order polymer.

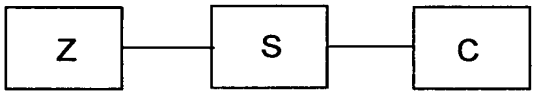
11. The optical device according to claim 2, wherein at least one of said gratings is comprised of an optical nonlinear second-order polymer that is the same as said polymer that comprises said waveguide.

12. The optical device according to claim 2, wherein at least one of said gratings is comprised of an optical nonlinear second-order polymer that is different than said polymer that comprises said waveguide.

13. The optical device according to claim 2, which further comprises a ground.

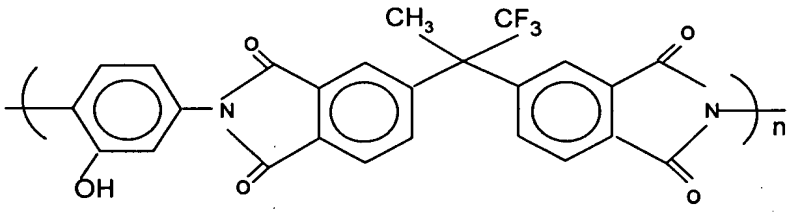
14. The optical device according to claim 2, wherein said optical nonlinear second-order polymer is selected from the group consisting of modified polyimide-hydroxy-diazo-sulfone, polyimide-amine-azo-nitro and polyimide-amine-diazo-dinitro.

15. The optical device according to claim 2, wherein said optical nonlinear second-order polymer has the structure



wherein Z is a polymer backbone, S is a spacer attached to Z, and C is an azo or stilbene chromophore.

16. The optical device according to claim 15, wherein Z is



where n ranges from about 20 to about 600.

17. The optical device according to claim 15, wherein S is a carbon chain comprising from 0 to 30 atoms.

18. The optical device according to claim 15, wherein C is dialkyl-amino-sulfone-stilbene.

19. An optical device comprising:

(a) a waveguide layer that includes a waveguide comprised of a second-order nonlinear optical polymer and a first and second grating;

(b) a first electrode positioned so as to communicate a negative electric field to said first grating upon application of a negative voltage to said first electrode;

(c) a second electrode positioned so as to communicate a positive electric field to said second grating upon application of a positive second voltage to said second electrode;

(d) a substrate layer;

(e) a first cladding layer positioned between said first and second electrodes and said waveguide layer; and

(f) a second cladding layer positioned between said waveguide layer and said substrate layer.

20. An optical device comprising:

(a) a waveguide layer that includes a waveguide comprised of a second-order nonlinear optical polymer and at least one grating;

(b) a means for communicating a negative electric field to one end of said grating; and

(c) a means for communicating a positive electric field to the other end of said grating.

21. An optical device comprising:

(a) a waveguide layer that includes a waveguide comprised of a second-order nonlinear optical polymer and at least one grating;

(b) a first electrode positioned so as to communicate a negative electric field to one end of said grating upon application of a negative voltage to said first electrode; and

(c) a second electrode positioned so as to communicate a positive electric field to the other end of said grating upon application of a positive voltage to said second electrode.

22. An optical device comprising:

(a) a waveguide layer that includes a waveguide comprised of a second-order nonlinear optical polymer and at least one grating;

(b) a first electrode positioned so as to communicate a negative electric field to one end of said grating upon application of a negative voltage to said first electrode;

(c) a second electrode positioned so as to communicate a positive electric field to the other end of said grating upon application of a positive second voltage to said second electrode;

(d) a substrate layer;

(e) a first cladding layer positioned between said first and second electrodes and said waveguide layer; and

(f) a second cladding layer positioned between said waveguide layer and said substrate layer.

23. A method for modulating or amplifying light traveling along a waveguide comprising the steps of:

(a) applying an optical signal to a waveguide that is comprised of a second-order nonlinear optical polymer and contains a first and second grating;

(b) applying a negative voltage to a first electrode positioned so as to communicate a negative electric field to said first grating; and

(c) applying a positive voltage to a second electrode positioned so as to communicate a positive electric field to said second grating.

24. A method for modulating or amplifying light traveling along a waveguide comprising the steps of:

(a) applying an optical signal to a waveguide that is comprised of a second-order nonlinear optical polymer and at least one grating;

(b) applying a negative voltage to a first electrode positioned so as to communicate a negative electric field to one end of said grating; and

(c) applying a positive voltage to a second electrode positioned so as to communicate a positive electric field to the other end of said grating.